

REFERENCES

- A. O. Olaniyi, A. M. A., M. F. Ramli, A. M. Sood. (2013). Agricultural Land Use In Malaysia and Implications For Food Security. *Bulgarian Journal of Agricultural Science*, 19 60-69.
- Abdullah, N., & Sulaim, F. (2013). The Oil Palm Wastes in Malaysia. doi: 10.5772/55302
- Acharjee, T. C., Coronella, C. J., & Vasquez, V. R. (2011). Effect of thermal pretreatment on equilibrium moisture content of lignocellulosic biomass. *Bioresour Technol*, 102(7), 4849-4854. doi: 10.1016/j.biortech.2011.01.018
- AIM. (2013) National Biomass Strategy 2020: New wealth creation for Malaysia's biomass industry. Kuala Lumpur: Agensi Inovasi Malaysia
- Akhtar, J., & Amin, N. A. S. (2011). A review on process conditions for optimum bio-oil yield in hydrothermal liquefaction of biomass. *Renewable and Sustainable Energy Reviews*, 15(3), 1615-1624. doi: 10.1016/j.rser.2010.11.054
- Arias, B., Pevida, C., Feroso, J., Plaza, M. G., Rubiera, F., & Pis, J. J. (2008). Influence of torrefaction on the grindability and reactivity of woody biomass. *Fuel Processing Technology*, 89(2), 169–175. <http://doi.org/10.1016/j.fuproc.2007.09.002>
- Asadieraghi, M., & Daud, W. M. A. W. (2015). In-depth investigation on thermochemical characteristics of palm oil biomasses as potential biofuel sources. *Journal of Analytical and Applied Pyrolysis*, 115, 379–391. <http://doi.org/10.1016/j.jaap.2015.08.017>
- Asadullah, M., Adi, A. M., Suhada, N., Malek, N. H., Saringat, M. I., & Azdarpour, A. (2014). Optimization of palm kernel shell torrefaction to produce energy densified bio-coal. *Energy Conversion and Management*, 88, 1086–1093. <http://doi.org/10.1016/j.enconman.2014.04.071>
- Awalludin, M. F., Sulaiman, O., Hashim, R., & Nadhari, W. N. A. W. (2015). An overview of the oil palm industry in Malaysia and its waste utilization through thermochemical conversion, specifically via liquefaction. *Renewable and Sustainable Energy Reviews*, 50, 1469–1484. <http://doi.org/10.1016/j.rser.2015.05.085>
- Basu, P. (2013). *Biomass Gasification, Pyrolysis and Torrefaction*. *Biomass Gasification, Pyrolysis and Torrefaction*. <http://doi.org/10.1016/B978-0-12->

396488-5.00013-7

- Bates, R. B., & Ghoniem, A. F. (2012). Biomass torrefaction: modeling of volatile and solid product evolution kinetics. *Bioresour Technol*, 124, 460-469. doi: 10.1016/j.biortech.2012.07.018
- Center, S. E. R. (2016). Scanning Electron Microscopy (SEM). from http://serc.carleton.edu/research_education/geochemsheets/techniques/SEM.html
- Chen, W. H., Zhuang, Y. Q., Liu, S. H., Juang, T. T., & Tsai, C. M. (2016). Product characteristics from the torrefaction of oil palm fiber pellets in inert and oxidative atmospheres. *Bioresour Technol*, 199, 367-374. doi: 10.1016/j.biortech.2015.08.066
- Chew, J. J., & Doshi, V. (2011). Recent advances in biomass pretreatment – Torrefaction fundamentals and technology. *Renewable and Sustainable Energy Reviews*, 15(8), 4212-4222. doi: 10.1016/j.rser.2011.09.017
- Chin, K. L., H'ng, P. S., Go, W. Z., Wong, W. Z., Lim, T. W., Maminski, M., ... Luqman, A. C. (2013). Optimization of torrefaction conditions for high energy density solid biofuel from oil palm biomass and fast growing species available in Malaysia. *Industrial Crops and Products*, 49, 768-774. <http://doi.org/10.1016/j.indcrop.2013.06.007>
- Chong, C., Ni, W., Ma, L., Liu, P., & Li, Z. (2015). The Use of Energy in Malaysia: Tracing Energy Flows from Primary Source to End Use. *Energies*, 8(4), 2828-2866. doi: 10.3390/en8042828
- Colomba Di Blasi, M. L. (1997). Intrinsic kinetics of isothermal xylan degradation in inert atmosphere. *Journal of Analytical and Applied Pyrolysis*, 40-41, 287-303.
- Commission, E. (1997). *Energy for the future: Renewable sources of energy*. White Paper for a Community Strategy and Action Plan.
- Demirbas, A. (2009) *Biohydrogen* (1 ed.). New York: Springer.
- Dietenberger, M. A., & Hasburgh, L. E. (2016). *Wood Products: Thermal Degradation and Fire. Reference Module in Materials Science and Materials Engineering*. Elsevier Ltd. <http://doi.org/10.1016/B978-0-12-803581-8.03338-5>
- Granados, D. A., Velázquez, H. I., & Chejne, F. (2014). Energetic and exergetic evaluation of residual biomass in a torrefaction process. *Energy*, 74, 181-189. doi: 10.1016/j.energy.2014.05.046
- Hisham, M., Uemura, Y., & Tazli, M. (2016). Torrefaction of Empty Fruit Bunches in Inert Condition at Various Temperature and Time. *Procedia Engineering*, 148,

- 573–579. <http://doi.org/10.1016/j.proeng.2016.06.514>
- Japanese company plans to turn oil palm waste to biofuel in Malaysia. (2006). from http://english.people.com.cn/200606/26/eng20060626_277455.html
- Kelly-Yong, T. L., Lee, K. T., Mohamed, A. R., & Bhatia, S. (2007). Potential of hydrogen from oil palm biomass as a source of renewable energy worldwide. *Energy Policy*, 35(11), 5692-5701. doi: 10.1016/j.enpol.2007.06.017
- Kolokolova, O., Levi, T., Pang, S., & Herrington, P. (2013). Torrefactions and pyrolysis of biomass waste in continuous reactors. *Cest2013*.
- Li, T., Wang, L., Ku, X., Güell, B. M., Løvås, T., & Shaddix, C. R. (2015). Experimental and modeling study of the effect of torrefaction on the rapid devolatilization of biomass. *Energy and Fuels*, 29(7), 4328–4338. <http://doi.org/10.1021/acs.energyfuels.5b00348>
- Lieve Helsen, E. V. d. B. (2000). Kinetics of the low-temperature pyrolysis of chromated copper arsenate-treated wood. *Journal of Analytical and Applied Pyrolysis*, 53, 51-79.
- Lim, S., & Teong, L. K. (2010). Recent trends, opportunities and challenges of biodiesel in Malaysia: An overview. *Renewable and Sustainable Energy Reviews*, 14(3), 938-954. doi: 10.1016/j.rser.2009.10.027
- Lu, K. M., Lee, W. J., Chen, W. H., Liu, S. H., & Lin, T. C. (2012). Torrefaction and low temperature carbonization of oil palm fiber and Eucalyptus in nitrogen and air atmospheres. *Bioresour Technol*, 123, 98-105. doi: 10.1016/j.biortech.2012.07.096
- Ludin NA, M. M., Hashim M, Sawilla B, Menon NR, Mokhtar H. (2004). Palm oil biomass for electricity generation in Malaysia. from [http://www.biogen.org.my/bris/BioGen/Tech/\(d\)Documents/technology\(d\)7.pdf](http://www.biogen.org.my/bris/BioGen/Tech/(d)Documents/technology(d)7.pdf)
- M. Hasan, A. L. A., B.H. Hameed. (2008). Adsorption of reactive dye onto cross-linked chitosan/oil palm ash composite beads. *Chemical Engineering Journal*, 136, 164-172.
- Matali, S., Rahman, N. A., Idris, S. S., Yaacob, N., & Alias, A. B. (2016). Lignocellulosic Biomass Solid Fuel Properties Enhancement via Torrefaction. *Procedia Engineering*, 148, 671–678. <http://doi.org/10.1016/j.proeng.2016.06.550>
- Mohamed, A. R., Mohammadi, M., & Darzi, G. N. (2010). Preparation of carbon molecular sieve from lignocellulosic biomass: A review. *Renewable and Sustainable Energy Reviews*, 14(6), 1591-1599. doi: 10.1016/j.rser.2010.01.024

- Mohammed, M. A. A., Salmiaton, A., Wan Azlina, W. A. K. G., Mohammad Amran, M. S., Fakhru'l-Razi, A., & Taufiq-Yap, Y. H. (2011). Hydrogen rich gas from oil palm biomass as a potential source of renewable energy in Malaysia. *Renewable and Sustainable Energy Reviews*, 15(2), 1258-1270. doi: 10.1016/j.rser.2010.10.003
- Mundi, I. (2015). Palm Oil Exports by Country. Available from United States Department of Agriculture, from IndexMundi
- Na, B.-I., Kim, Y.-H., Lim, W.-S., Lee, S.-M., Lee, H.-W., & Lee, J.-W. (2013). Torrefaction of oil palm mesocarp fiber and their effect on pelletizing. *Biomass and Bioenergy*, 52, 159-165. doi: 10.1016/j.biombioe.2013.02.041
- Ng, W. P. Q., Lam, H. L., Ng, F. Y., Kamal, M., & Lim, J. H. E. (2012). Waste-to-wealth: green potential from palm biomass in Malaysia. *Journal of Cleaner Production*, 34, 57-65. doi: 10.1016/j.jclepro.2012.04.004
- PalmOilWorld.org. (2013). Malaysian Plam Oil Industry. from http://www.palmoilworld.org/about_malaysian-industry.html
- Peng, J. H. (2012). *A STUDY OF SOFTWOOD TORREFACTION AND DENSIFICATION FOR THE PRODUCTION OF HIGH QUALITY WOOD PELLETS*. THE UNIVERSITY OF BRITISH COLUMBIA.
- Poudel, J., Ohm, T. I., Gu, J. H., Shin, M. C., & Oh, S. C. (2016). Comparative study of torrefaction of empty fruit bunches and palm kernel shell. *Journal of Material Cycles and Waste Management*, 1–11. <http://doi.org/10.1007/s10163-016-0492-1>
- Power, C. E. (2006). Chubu Electric Power to engage in Malaysian project to generate power from oil palm empty fruit bunch biomass– first Chubu Electric Power project in Malaysia. from http://www.chuden.co.jp/english/corporate/press2006/0728_1.html
- Prins, M. J., Ptasiński, K. J., & Janssen, F. J. J. G. (2006). Torrefaction of wood. *Journal of Analytical and Applied Pyrolysis*, 77(1), 28-34. doi: 10.1016/j.jaap.2006.01.002
- Pudukudy, M., Yaakob, Z., Mohammad, M., Narayanan, B., & Sopian, K. (2013). Renewable hydrogen economy in Asia – Opportunities and challenges: An overview. <http://doi.org/10.1016/j.rser.2013.11.015>
- Richard B. Bates, A. F. G. (2012). Biomass torrefaction: Modeling of volatile and solid product evolution kinetics. *Bioresource Technology*, 124, 460–469. doi: 10.1016/j.biortech.2012.07.018

- Sabil, K. M., Aziz, M. A., Lal, B., & Uemura, Y. (2013a). Effects of torrefaction on the physicochemical properties of oil palm empty fruit bunches, mesocarp fiber and kernel shell. *Biomass and Bioenergy*, 56, 351–360. <http://doi.org/10.1016/j.biombioe.2013.05.015>
- Sabil, K. M., Aziz, M. A., Lal, B., & Uemura, Y. (2013b). Synthetic indicator on the severity of torrefaction of oil palm biomass residues through mass loss measurement. *Applied Energy*, 111, 821–826. <http://doi.org/10.1016/j.apenergy.2013.05.067>
- Sarvaramini, A., Assima, G. P., & Larachi, F. (2013). Dry torrefaction of biomass – Torrefied products and torrefaction kinetics using the distributed activation energy model. *Chemical Engineering Journal*, 229, 498-507. doi: 10.1016/j.cej.2013.06.056
- Shang, Ahrenfeldt, Jesper Holm, Kai, J., Bach, L. S., Stelte, W., & Henriksen, U. B. (2014). Kinetic model for torrefaction of wood chips in a pilot-scale continuous reactor. *Journal of Analytical and Applied Pyrolysis*, 108, 109-116. doi: 10.1016/j.jaap.2014.05.010
- Shang, L., Fei, Q., Zhang, Y. H., Wang, X. Z., Fan, D.-D., & Chang, H. N. (2011). Thermal Properties and Biodegradability Studies of Poly(3-hydroxybutyrate-co-3-hydroxyvalerate). *Journal of Polymers and the Environment*, 20(1), 23-28. doi: 10.1007/s10924-011-0362-9
- Shawabkeh, R., Al-Harabsheh, A., & Al-Otoom, A. (2004). Copper and zinc sorption by treated oil shale ash. *Separation and Purification Technology*, 40(3), 251-257. doi: 10.1016/j.seppur.2004.03.006
- Shuit, S. H., Tan, K. T., Lee, K. T., & Kamaruddin, A. H. (2009). Oil palm biomass as a sustainable energy source: A Malaysian case study. *Energy*, 34(9), 1225-1235. doi: 10.1016/j.energy.2009.05.008
- Stelte, W., Nielsen, N. P. K., Hansen, H. O., Dahl, J., Shang, L., & Sanadi, A. R. (2013). Pelletizing properties of torrefied wheat straw. *Biomass and Bioenergy*, 49, 214-221. doi: 10.1016/j.biombioe.2012.12.025
- Tapasvi, D., Khalil, R., Várhegyi, G., Tran, K.-Q., Grønli, M., & Skreiberg, Ø. (2013). Thermal Decomposition Kinetics of Woods with an Emphasis on Torrefaction. *Energy & Fuels*, 27(10), 6134-6145. doi: 10.1021/ef4016075

- Thanapal, S. S., Chen, W., Annamalai, K., Carlin, N., Ansley, R. J., & Ranjan, D. (2014). Carbon Dioxide Torrefaction of Woody Biomass. *Energy & Fuels*, 28(2), 1147-1157. doi: 10.1021/ef4022625
- Tumuluru, J. S., Sokhansanj, S., Hess, J. R., Wright, C. T., & Boardman, R. D. (2011). A review on biomass torrefaction process and product properties for energy applications. *Industrial Biotechnology*, 7(5), 384-401. <http://doi.org/10.1089/ind.2011.0014>
- Uemura, Y., Omar, W. N., Tsutsui, T., & Yusup, S. B. (2011). Torrefaction of oil palm wastes. *Fuel*, 90(8), 2585-2591. <http://doi.org/10.1016/j.fuel.2011.03.021>
- Uemura, Y., Omar, W. N., Tsutsui, T., Yusup, S. B., Friends of the Earth, Basiron, Y., ... Wahjoedi, B. a. . (2013). Oil palm biomass as a sustainable energy source: A Malaysian case study. *Biomass and Bioenergy*, 3(1), 97-103. <http://doi.org/10.1016/j.jclepro.2012.04.004>
- Van der Stelt, M. J. C. (2011). Chemistry and reaction kinetics of biowaste torrefaction. (*Ph.D. thesis*).
- Van der Stelt, M. J. C., Gerhauser, H., Kiel, J. H. A., & Ptasinski, K. J. (2011). Biomass upgrading by torrefaction for the production of biofuels: A review. *Biomass and Bioenergy*. doi: 10.1016/j.biombioe.2011.06.023
- W. H. Chen, P.-C. (2011). Isothermal torrefaction kinetics of hemicellulose, cellulose, lignin and xylan using thermogravimetric analysis. *Energy*, 36(11), 6451-6460. doi: 10.1016/j.energy.2011.09.022
- Wang, L., V árhgyi, G., & Skreiberg, Ø. (2014). CO₂ Gasification of Torrefied Wood: A Kinetic Study. *Energy & Fuels*, 28(12), 7582-7590. doi: 10.1021/ef502308e
- Yaman, S. (2004). Pyrolysis of biomass to produce fuels and chemical feedstocks. *Energy Conversion and Management*, 45(5), 651-671. doi: 10.1016/s0196-8904(03)00177-8
- Zainudin, N., Lee, K., Kamaruddin, A., Bhatia, S., & Mohamed, A. (2005). Study of adsorbent prepared from oil palm ash (OPA) for flue gas desulfurization. *Separation and Purification Technology*, 45(1), 50-60. doi: 10.1016/j.seppur.2005.02.008
- Zheng, A., Zhao, Z., Huang, Z., Zhao, K., Wei, G., Wang, X., ... Li, H. (2014). Catalytic fast pyrolysis of biomass pretreated by torrefaction with varying severity. *Energy & Fuels*, 140811003216003. <http://doi.org/10.1021/ef500892k>